

NASA SPoRT Modeling and Data Assimilation Research and Transition Activities

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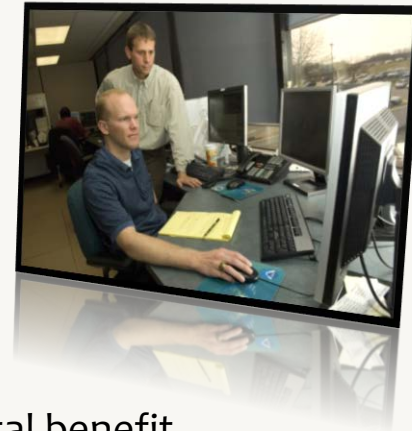


Short-term Prediction Research and Transition (SPoRT) Center

SPoRT is focused on transitioning unique NASA and NOAA observations and research capabilities to the operational weather community to improve short-term weather forecasts on a regional and local scale.

- close collaboration with numerous WFOs and National Centers across the country
- complementary to JCSDA
- use experimental modeling systems that are modeled after operational systems

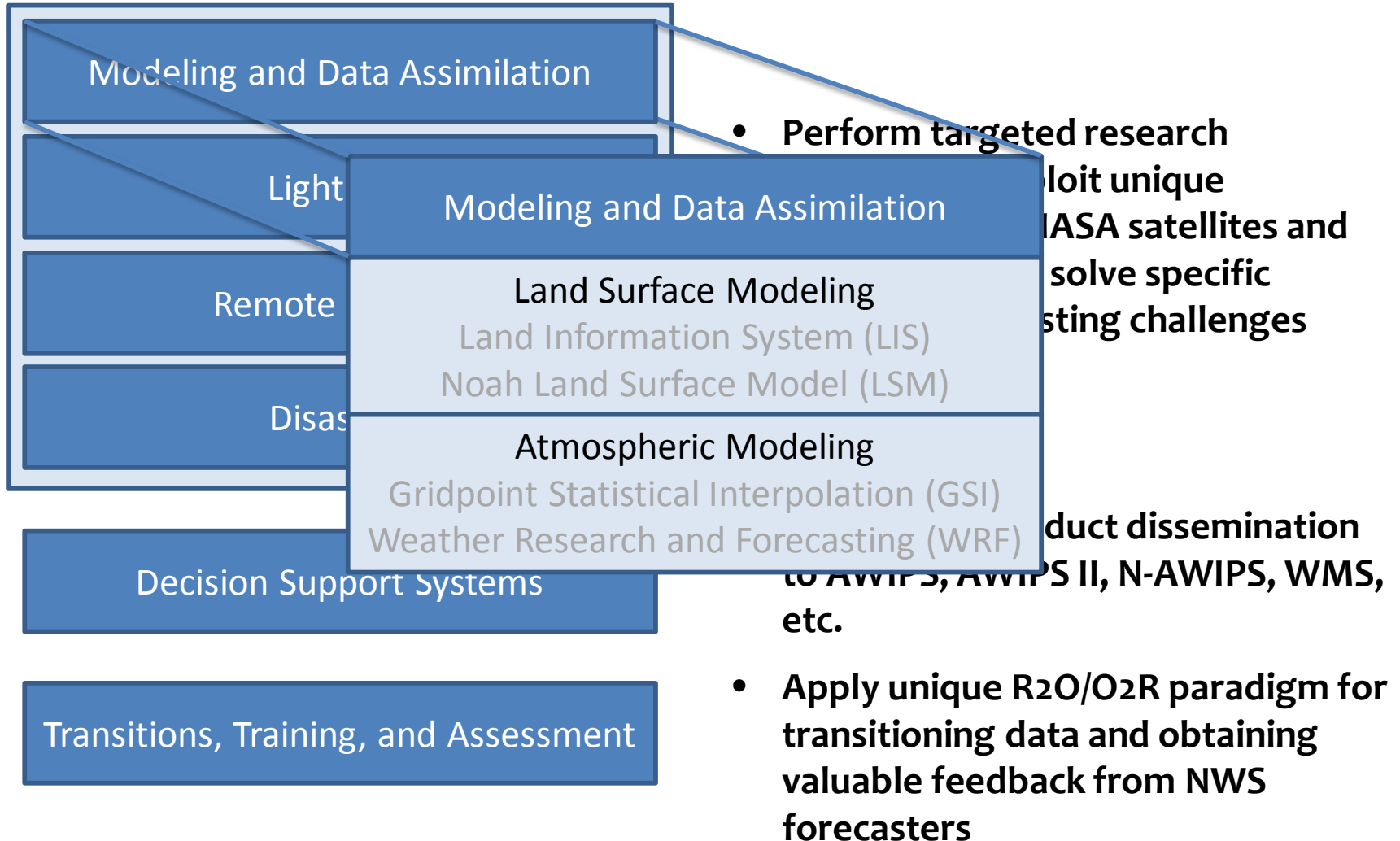
Proven paradigm for transition of research and experimental data to “operations”



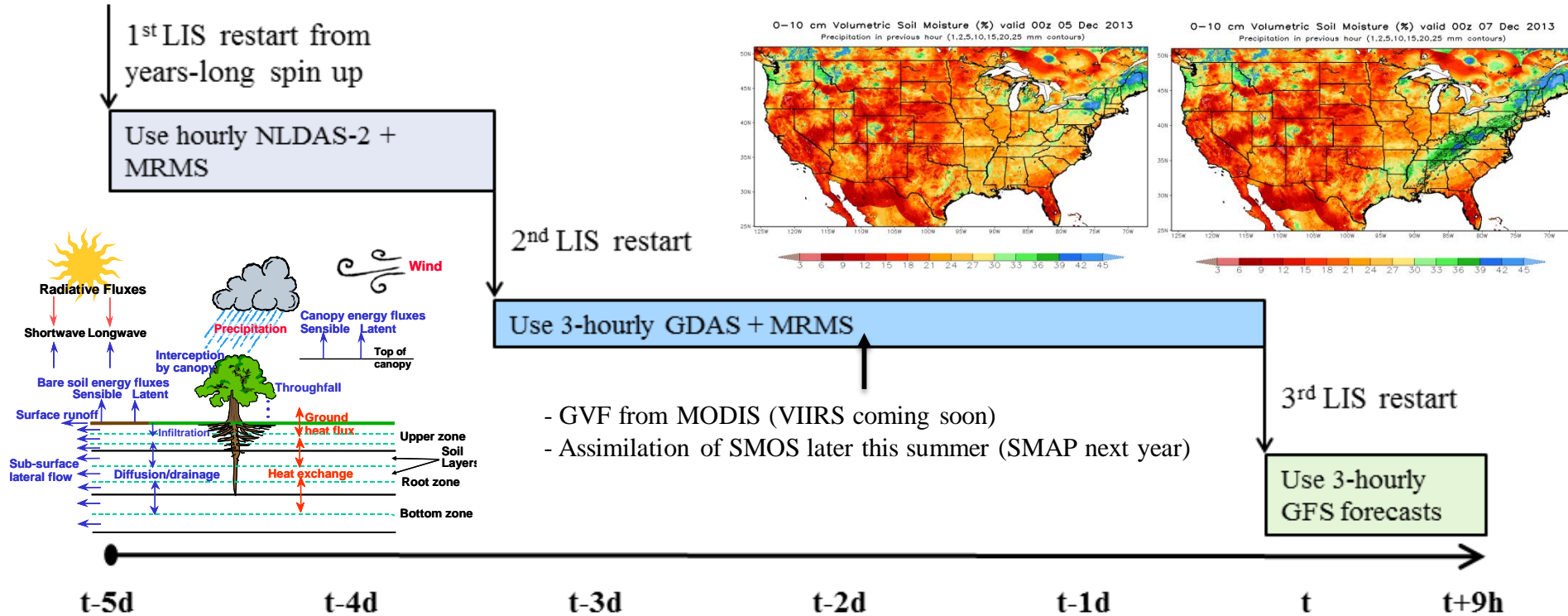
Benefit

- demonstrate capability of NASA and NOAA experimental products to weather applications and societal benefit
- prepares forecasters and modeling systems for use of data from next generation of operational satellites (JPSS, GOES-R)

SPoRT Areas of Expertise



Land: Operational SPoRT LIS



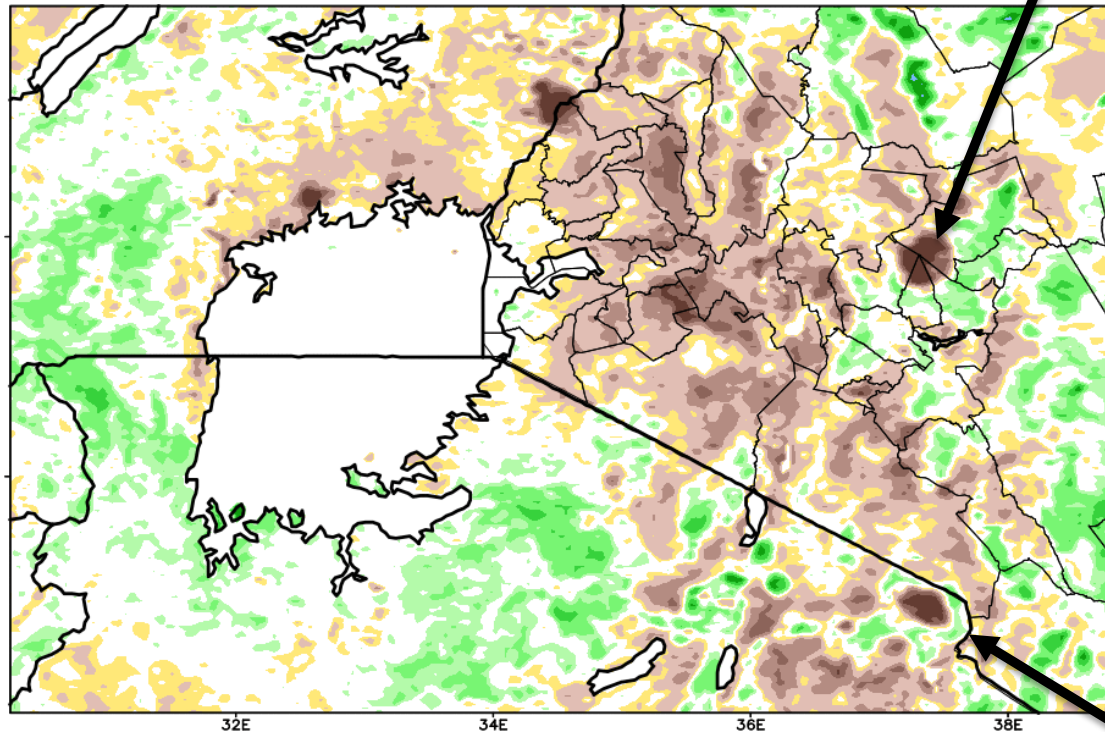
- NASA LIS used to perform long-term integration of Noah LSM updated in real-time
- Assimilation of soil moisture during 2nd LIS restart should give even more accurate LSM soil moisture fields
- Output used for situational awareness and local modeling by forecasters at select NWS offices and international forecasting agencies

Land: Impact of VIIRS GVF

Green Vegetation Fraction (%)
Control 0-h Forecast Valid: 00Z 31 MAY 2015



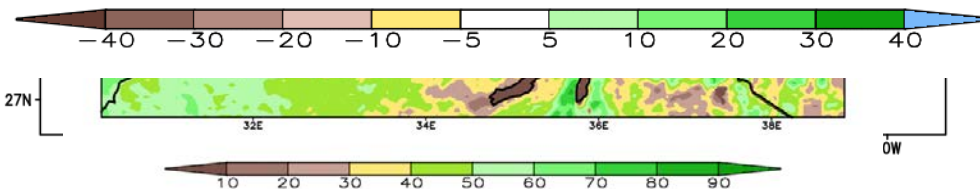
GVF Diff (VIIRS - Control, %)
VIIRS 0-h Forecast Valid: 00Z 31 MAY 2015



Mt. Kenya

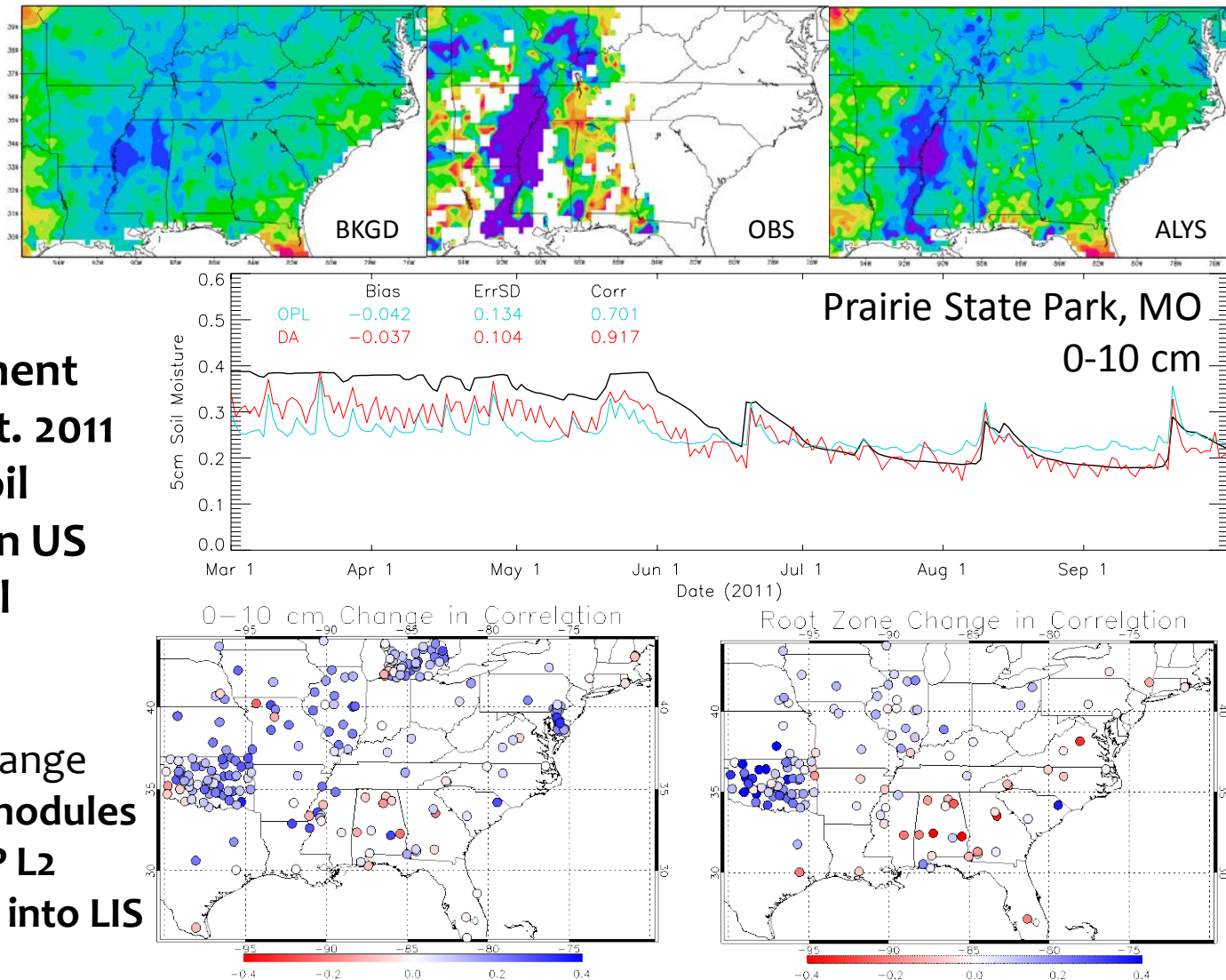
Mt. Kilimanjaro

- NWP models use a lower-resolution climatology of vegetation
- Large differences may occur depending on weather patterns or land surface features that aren't resolved
- Differences in vegetation can lead to different representation of surface fluxes in NWP models
- Using global 4-km resolution GVF product developed by NESDIS



Land: Satellite-Observed Soil Moisture

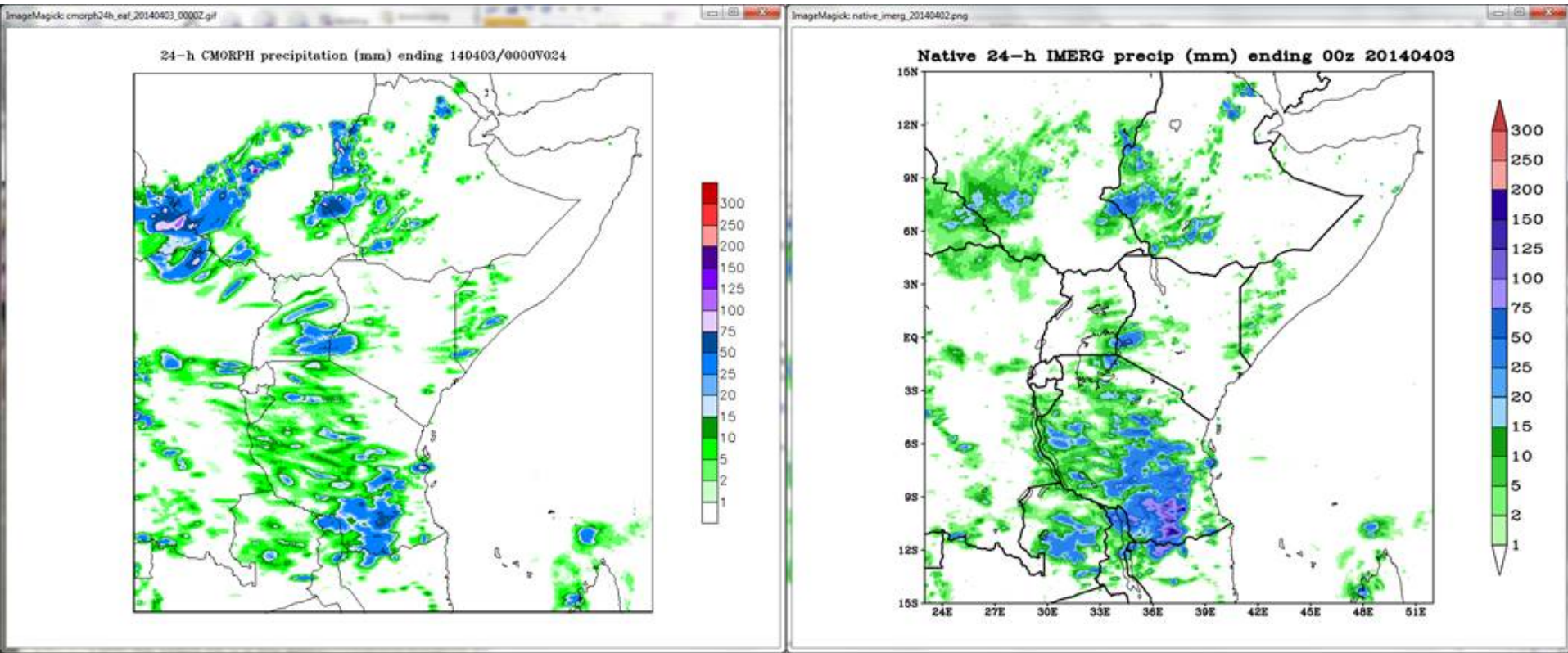
- Assimilation of soil moisture retrievals from SMOS using Ensemble Kalman Filter in LIS
- Performed data assimilation experiment from 1 Mar. – 30 Sept. 2011
- Validation against soil moisture networks in US (North American Soil Moisture Database)
 - Better correlations
 - Improved dynamic range
- Currently developing modules in to bring NASA SMAP L2 Active-Passive product into LIS



Degraded w/ DA Improved w/DA



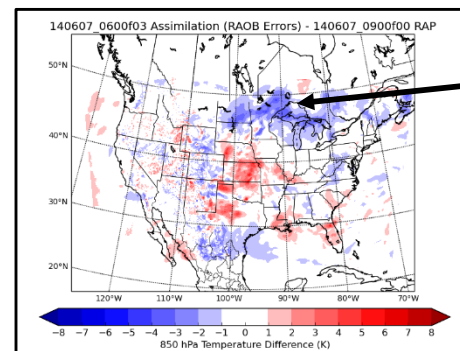
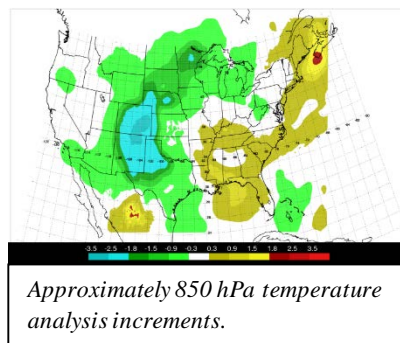
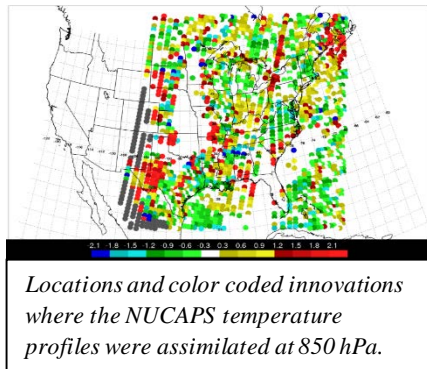
Land: IMERG Product for Precipitation Forcing



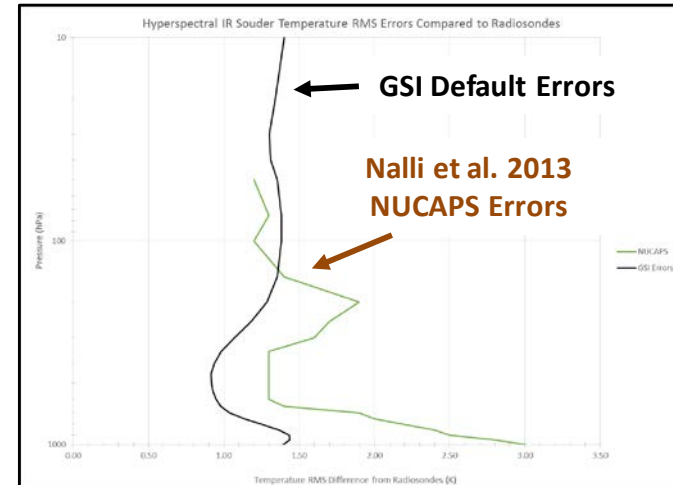
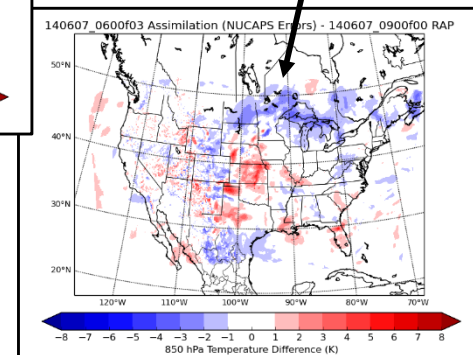
- GPM IMERG L3 product (right) into LIS to replace legacy CMORPH (left) as precipitation forcing dataset for OCONUS applications
- IMERG will also be used by forecasters to validate regional model forecasts of precipitation

Atmosphere: NUCAPS Assimilation

- Limits to assimilating only cloud-cleared radiances
- Satellite profiles traditionally assimilated as radiosonde observations and assigned radiosonde errors

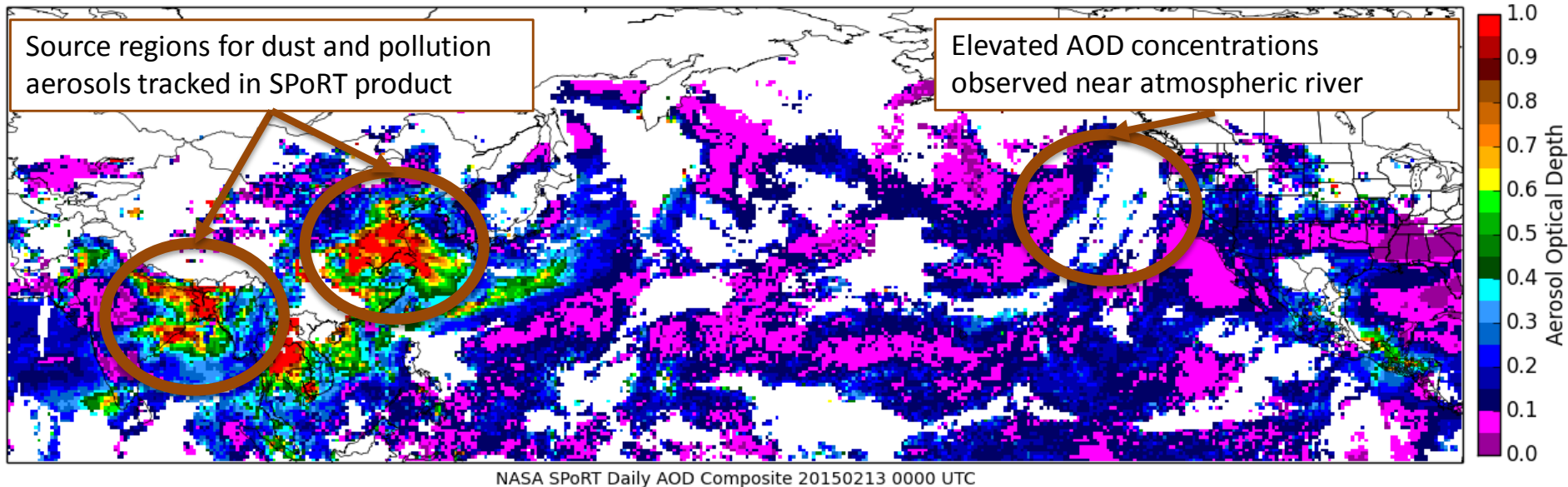


Temperature analysis with assimilation of NUCAPS profiles with representative errors closer to verification dataset, but changes are subtle



- Results show the new temperature and moisture analysis including NUCAPS assimilation with representative error is closer to the verification data set than NUCAPS assimilation with radiosonde errors

Atmosphere: Cloud/Aerosol Interaction



NASA SPoRT Daily AOD Composite 20150213 0000 UTC

- Asia is a major source region for dust and pollution aerosols that track across the Pacific Ocean and impact weather in North America
- Asian aerosols can modify the precipitation processes associated with atmospheric river events
- Use SPoRT AOD composites and CalWater 1 & 2 field campaign measurements along with WRF-Chem simulations to understand impact of aerosols on these cloud and precipitation processes

Summary

- **NASA SPoRT is a research-to-operations center focused on transition of NASA and NOAA satellite data and capabilities to operations to solve regional/local scale, short-term (0-48 hr) forecasting challenges**
- **Expertise in land and atmospheric modeling and data assimilation**
- **Use systems that mimic operational systems**
 - **Land: LIS and Noah LSM**
 - **Atmosphere: WRF and GSI**
- **Assimilating satellite datasets into these systems to improve numerical weather prediction**
 - **Land: VIIRS GVF, SMOS and SMAP soil moisture, GPM IMERG precipitation**
 - **Atmosphere: CrIS (NUCAPS) temperature and moisture profiles, GOES/MODIS aerosols**

